Working Paper H

5 October 1981

MEMORANDUM FOR: Members of Strategic Planning Working Group on Information Handling Facilities

25X1 FROM: [redacted]
Chairman

SUBJECT: Discussion Issues and Working Group Expectations

ATTACHMENTS:
a. Paper titled "Overview of Information Handling Facilities Concern"
b. Paper titled "Terminals"
c. Paper titled "Data Bases"
d. Paper titled "Data Transmission, Dissemination and Distribution"

## 1.0 INTRODUCTION

In preparation for the Working Group Meetings on Strategic Planning for Information Handling Facilities, the IHSA Staff has written four papers; one an overview and the other three on topical areas (see attachments). These papers are intended to provide information on current status, focus the issues, and present key questions--with the expectation that the answers will aid in setting planning goals and objectives. The papers are being made available to Working Group Members one week in advance of the first meeting to help in preparing.

In following sections a summary of the overview paper is provided, and for each of the topical areas, the planning issues and expectations of the Working Group in responding to the issues are presented.

First, however, it should be clear that the Working Group need not be constrained to those issues to follow; indeed, participants are encouraged to present other issues they believe to be pertinent to the planning process for Information Handling Facilities.

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## 2.0 SUMMARY OF OVERVIEW PAPER

Growth rates in message traffic, VM service, and disk storage are presented, with an explanation that the growth has been absorbed by technology advances. The paper establishes the linkage between numbers of terminals and the need for Data Processing and Communications Facilities, and suggests that planning activities clearly define this linkage.

While pointing out that technology has absorbed much of the growth in Information Handling Facilities notes of caution for the future are expressed.

Office Automation Services are singled out for the potential of having a profound impact on Information Handling Facilities during the planning period. The paper points out that payoff assessment will be increasingly important as the Agency invests in Office Automation.

## 3.0 TERMINALS

### The Issues

During the eighties the Agency will be challenged by the need to provide a terminal for most management, professional, and clerical employees. The investment for just the terminals could exceed $100,000,000 if we are to fully meet this need; this presents a question of affordability. Accordingly, we must understand better who is to have terminals, when, and what type.

### Working Group Expectations

- To provide estimates of numbers of terminals, by type, to be installed each year during the planning period (through 1989).
- Define characteristics of terminals in regard to:
    - Data Processing
    - Local Storage and Retrieval
    - Graphics
    - Electronic Mail
    - Local Network Support

- o Develop planning assumptions for distributed versus centralized functionality.

- o Review current and planned programs to determine deficiencies in satisfying Agency needs through the eighties.

## 4.0 DATA BASE FACILITIES

### The Issues

During the eighties we will be challenged by:

- o Increasing quantities, sizes, and types of data bases.

- o Increasing numbers of users.

- o The need to make data bases more widely accessible.

- o The need to provide easy to use tools (Query Languages, statistical analysis, modeling, graphics, etc.) to allow effective utilization of large quantities of data.

### Working Group Expectations

- o Establish growth estimates for quantities and sizes of data bases through the planning period (1989). Characterize types of data bases. Estimate the number of users for each type of data base.

- o Describe Data Base related tools that will be needed for effective utilization.

- o Provide estimates for needs to access community data bases.

- o Express strategic, or qualitative, arguments which should be factored into the planning process.

- o Review current and planned programs to determine deficiencies in satisfying Agency needs through the eighties.

## 5.0 DATA TRANSMISSION, DISSEMINATION AND DISTRIBUTION

### The Issues

During the eighties the Agency will be challenged with providing the necessary communications and dissemination facilities to carry and disseminate increasing volumes of information to the right people in a timely manner. Trends, which will have an impact, include:

- o New overseas facilities and procedures, such as CRAFT.
- o Dispersion of more terminals in the Washington area and the need for connectivity (terminal to terminal, terminal to multiple computer systems).
- o More information, particularly open source information, will be distributed in electronic form.
- o New Office Automation functions such as electronic mail, teleconferencing, and shared electronic files place demands on local communications capabilities.

There are several large programs either in development, or in the planning stage, which provide increased facilities for carrying and disseminating information. There must be an assessment of the adequacy of these programs to take us through the eighties.

### Working Group Expectations

- o Characterize and provide estimates for new operating procedures and new services which drive requirements for distribution and dissemination facilities.
- o Express strategic, or qualitative, arguments which should be factored into the planning process.
- o Review current and planned programs to determine deficiencies in satisfying Agency needs through the eighties.

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# Overview of the Information Handling Facilities Concern

## 1. The Dynamics of the Agency's IHS Environment

In spite of the fact that the personnel dedicated to IHS services in the Agency have actually been declining, the volume and variety of services have been steadily growing. In fact, the growth has generally been exponential over the past few years, and the compound percentage rates have been high.

Figures 1 and 2 show the Agency message traffic carried by the Office of Communications. As can be seen, the growth approximates exponential. The correlations of the data with exponential regression curves are good, and the growth rate is 10.8 percent per year for narrative traffic and 28.1 percent per year for data. These data reflect the urgent need for the new technology embodied in the MERCURY project, because the capacity growth capability of the current technology has been exhausted.

In the area of data processing, there has been a similar service growth. Figure 3 shows that the number of logged users on ODP's VM service has grown at a steadily exponential rate for the past four years. Since the VM service supports real time transactions, its growth reflects that in office automation functions. A similar story is told in the area of batch processing. Figure 4 shows the daily computer time required for batch for 1980 and 1981; earlier data was not available. Even so, the data correlates well with a regression curve reflecting an exponential growth of 18.5 percent per year.

A comparable history obtains for on-line storage. Figure 5 shows the growth in such data, both in megabytes of on-line storage and in the associated direct access storage devices (DASD). Although the data is much less frequent--annual, rather than the monthly data available for VM--the same exponential growth patterns is evident. In this case, the storage growth rate is 20.2 percent per year: a value comparable to VM growth.

Because there are strong indications of greatly increased intent to use IHS services, these growth rates probably have to be considered a base in projecting what the demand might be in the near future. The recent spurt in terminal acquisitions and requests, is detailed in the Terminals paper, exceeds a 20 percent per year growth rate. There has, in fact, been what might be considered an "explosion" in demand. Terminals, whether word processors, data terminals, or special purpose units, are the system access devices for the IHSs. It is reasonable to expect, therefore, that future demands for communications and data processing services correlate strongly with the number of terminals.

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There is also a natural progression of interaction skills relevant to users access of IHSs via terminals. The beginning applications are likely to be word processing, cable processing, or simple file structures. Once these have been mastered, there is a natural progression into more complex functions. Users might then develop complex, limited file structures, or write their own software to perform routine file loading functions or correlate file data in special ways, or they might analyze data using statistical packages. Ultimately, they might get into writing their own data analysis programs. Thus, the IHS service requirement per terminal can be expected to expand continuously, deriving the growth in service requirements above that related strictly to the number of terminals.

In considering the future, what we need, when we need it, and how we are going to get it, the rate of technological innovation is important. Almost all of the data processing productivity increases and a good deal of that in communications has been provided by technological innovation in the form of more performance per dollar. The chief engine for these advances has, of course, been the integrated circuit. A prime example of this is shown in figure 2. On-line user growth on VM has been provided by steadily advancing mainframe performance; we have not had to change the architecture. Solid state devices will continue to advance rapidly in capability, but there is a question as to whether the past rate of advance can be sustained. After a while, any technology runs up against physical limitations. There is then relative pause until a new technology is available to carry the functionality up to the next plateau.

An example of an area where technology has not saved us is direct access storage devices. We now have almost 500 disk drives in the RCC and SCC, and many more elsewhere. The large numbers of these peripheral devices relative to the number of mainframes are starting to present all kinds of problems, including reliability and operating software interaction. That the problem is not worse is due to advancing storage technology, as reflected in the difference between the 20.2 percent per year on-line storage access and the 8.4 percent per year of DASD in figure 5.

The concern is that we become too reliant in our planning upon technological innovation to solve all our problems, expecting and planning for miraculously advancing performance/cost characteristics. There are already some instances of the increasing difficulty of advances in solid state technology, such as the disappointment that bubble memory technology has provided to date. We need to be prudent in our planning, recognizing that there will be technological advances and perhaps planning on them where they are well indicated, but not depending upon them across the board.

The providers of IHS services have been struggling to keep up with the demand reflected in the foregoing data. Not all of the steadily increasing productivity was provided by advances in communications and data processing

technology, however. Unfortunately, because of resource constraints that obtained, some of it was provided by drawing down on engineering and development resources. That has left the providers in a somewhat weakened position to respond to what may well be an accelerated rate of growth over the historical levels. The implications with respect to development resource requirements need to be considered in the process of projecting future system capabilities.

2. Office Automation: A Current Planning Focus

An important factor in determining the IHS requirements in the foreseeable future is office automation. It will be a large creator of demand for data processing and communications services because the demand will vary at least in proportion to the number of terminals. The number of terminals, in turn, and particularly those connected to the central systems, is going to increase at a very high rate over the next several years--a rate limited by our ability to buy them, and install them, and support them, not user demand. Moreover, the demand represented by each terminal should also increase as users become more knowledgeable in taking advantage of the functionalities available.

Included in the office automation category are such services as:

- o word processing
- o electronic mail
- o cable preparation and sending
- o information dissemination, distribution and electronic filing
- o small file construction and manipulation
- o personal activities support

These are the services to be provided in SAFE and partially supplied now by the RCC and SCC. The bulk of those office automation services usually provided are supported in the VM environment. The advent of SAFE will provide relief to the RCC VM but, even so, the needs of the other directorates will keep the demand on VM increasing.

A principal concern in planning for this growth is "what is the payoff"? What productivity contribution derives from the investments in new office automation capabilities? The benefits fall into two general categories of automation: tasks and functions. It is usually fairly straightforward to assess the benefit of automating a task, since that normally eliminates the need for human labor.

The value of automating functions is more difficult to assess. The benefits of the latter are usually the provision of a superior capability and the increase of professional productivity. Both are much softer things to assess. As a practical consideration, also, it should be noted that the creative or analytic process can only be expedited so much by automation. There is a natural "gestation" process involved in the development of problem formulations and conclusions; and that has its own time requirements, unique to the application. The principal benefit of office automation with respect to functions is the alleviation of detractions and distractions to the creative and analytic processes so that more time can be devoted to them, rather than to expedite them.

In spite of the difficulties, we will need to assess the payoff of office automation with respect to both tasks and functions in a quantitative manner. It is needed to be able to deal with such questions as: How great an investment is worthwhile for each type of individual? How are these factors affected by the performance/cost character of the equipment? For the near term future, we do not have to worry about investing too much--we cannot provide enough capability fast enough to get anywhere near a point of marginal payoff versus cost. In the 1985-1989 time period covered by this strategic planning effort, however, the marginal investment concern is germaine.

It is not practical to think about a comprehensive, quantitative productivity payoff assessment within the timeframe of the development of this first strategic plan. That is something that will take concentrated attention and will have to come in subsequent refinements. (The measurement of office productivity for other than basic tasks is an industry wide problem today. No commonly accepted methodologies are known.) What needs to be done at this point is to develop some sort of picture of office automation needs and priorities on the basis of a qualitative sense of payoff. Generally speaking, the question is, what is the priority order of services needed in both the task and functional domains?

3. Some of the Top-Level Questions

This first strategic plan will be based primarily upon the definition of functional requirements, their priorities and the schedules that derive from the working groups. It is recognized, however, that these are developed in the light of available technology and its relative cost. Thus, perceptions of technological innovation are a dimension of the planning effort. Answers to the following general questions should do much to illuminate the time-phased performance goals for providers of IHS services.

- What sort of professional functions should be automated and with what priority?

- How important is the automation of menial tasks, reducing the need for low-skill labor, and making the slots available for analytic personnel? Is there a security motivation?

- How important is it to provide a powerful support environment so that analysts can efficiently develop their own small applications packages?

- What new technologies are seen as having a high payoff in the office automation environment, such as digitized voice or teleconferencing?

- How will overseas stations differ from headquarters in terms of required office automation functions? Should the objectives be to make overseas stations appear to users like just another station on the net?

- Is the SAFE architecture perceived to be appropriate to support office automation functions elsewhere than NFAC? If so, where and why?

- How important is it to introduce open source material directly into the Agency distribution system? Is there an adequate user community to justify the likely investment?

- Is a foreign language capability needed within the integrated system context? If so, what is the relative priority and timing?

# Information Handling Facilities

## Terminals

## I. INTRODUCTION

The importance of the "terminal" and its associated peripheral devices, such as light pens, disks, printers, etc., and its impact upon the Agency is most aptly stated in the Joint Strategic Plan, 1981- 1987, of the Office of Communications and Office of Data Processing:

> The growth in number and importance of remote visual display and printer stations presages a process which will find almost every employee using a terminal as an essential tool by the end of the decade.

It's the statement that followed this one that sums up the purpose of this paper: "If this concept is to be realized, planning and budgeting must take place now."

Terminals are identified as a specific dimension of the strategic planning for two reasons: they comprise one of the most costly components and they imply and produce demand for all the other information handling services. They are also of concern because the current demand seems to be explosive in character.

## II. STATUS

What is a terminal? or is it a Cathode-Ray Tube (CRT)? or a Visual Display Unit (VDU)? or a multi-function workstation? or a console? or a stand-alone word processor? or an electronic typewriter, etc.? Yet, this terminology problem reflects the very nature of the problems that we encounter in discussing terminals and their use in the Agency. For discussions at a very general level, the vague notion of a "terminal" and what that encompasses is often sufficient, as for example, in the preceding paragraphs. However, at any more specific level of detail, it is this very problem of defining what terminals are, and what they can do, and what we want them to do, and how may of each kind should we have, that poses many of the difficult issues that face this Agency. Diagram 1 categorizes the many different facets of how we view terminals in this Agency.

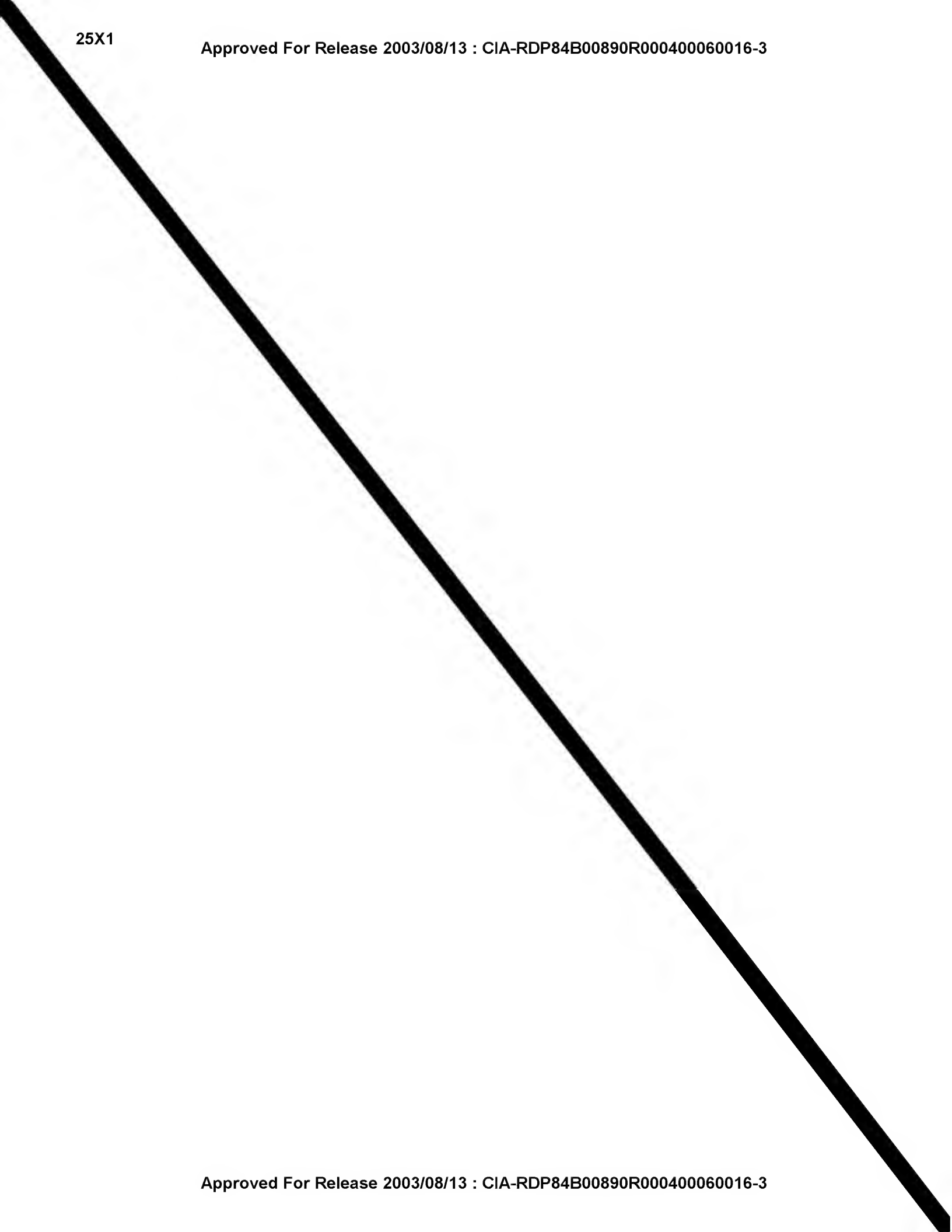

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Diagram 1 reveals the complexity of the problems of defining terminals because of the sometimes complicated relationships that exist between what a terminal does, how it is configured and the characteristics of a terminal. Out of the many possible definitions that we could use for a terminal, there exists two sets that are probably viewed as the two major categories that terminals are placed in today. These two sets are:

1. Terminals that are purchased as stand-alone word processors, NBI's, Laniers, CPT's, etc.

2. All the other terminals that are not in the first category.

It is obvious that the distinction we make for purchasing standalone word processors is fast fading, but given today's environment, it is a sufficient enough distinction in order to at least describe the quantities of terminals that exist in the Agency. The quantities of Agency terminals in each of these categories is given in Tables 1 and 2. These figures are estimates and are used only to provide an approximation of the terminals that exist today (September 20, 1981).. With the current demand for terminals, this status is changing rapidly.

Table 1 identifies the stand-alone word processors that are leased and/or purchased in the Agency by directorate. We are currently dealing with 12 different vendors in the procurement of these systems. They are: ARTEC, BURROUGHS, CPT, DEC, IBM, LANIER, LEXITRON, NBI, QXY, SAVIN, VYDEC and XEROX. This myriad of word processing systems is one reason ODP is currently drafting an RFP to standardize on an Agency word processing system.

Table 2 identifies the quantities of terminals that do not fall within the first category. Again, these numbers are best estimates provided only to give the reader an appreciation for the approximate number of terminals we are dealing with. Table 2 only identifies the more popular brands of terminals in the Agency. Special terminals, such as the Ramtek color graphic terminals, and others that are few in number are not identified in this table. The total number of terminals is estimated to be approximately 1550. As pointed out, this number does include 87 Send/Receive 733's, that in some cases, are used only for the purpose of a hardcopy device and not as a terminal.

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The total terminals identified in these tables is 2,358 along with 559 associated printers. These quantities are some measure of the terminals as they exist today in the Agency, with the exceptions noted.

On the following pages the GOALS and ISSUES revolving around terminals is discussed.

## III. GOALS AND ISSUES

Several major goals and issues need to be resolved by the working group. The major goal, on which everything else is predicated, is to determine the quantity of terminals that will satisfy each of the directorate's requirements for each year until the end of the decade. That this figure is growing so rapidly is evident from the graphs depicted in diagrams 2 and 3.

The first graph, shown below in diagram 2, displays the growth of stand-alone CRT word processing terminals within the Directorate of Operations within the last five years. Similar growth (maybe not as rapidly) is occuring throughout the Agency, as our different offices learn of the utility and efficiency of word processors in the office environment.

The second graph shows the likely annual acquisition rate of terminals indicated in the first draft of the RFP for an Agency word processor on the basis of user indications. It is contrasted with the same data in the third draft three months later.

The point being made by these two diagrams is that the requirements for terminals is dynamically changing on a month to month basis as more people realize the capabilities of these systems to improve their office productivity and the quality of their product. A realistic goal of the number of terminals we are dealing with needs to be made so that appropriate planning and budgeting can take place.

A modified view of the original assumption that was made in the OC/ODP Joint Strategic Plan is presented in Table 3. Let's assume that for each directorate, one could arrive at a perceived ratio of terminals for each of the following three categories of personnel, Professional, Clerical and Technical, in each of the Directorates. Ratios are given for personnel in Headquarters and

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Reasons for not choosing 100 percent ratios in each column are based upon the facts that there would be some positions for which there would be no need and some positions which would use a shared work station. These ratios are rough estimates taken to initiate this assessment process, and should be reestimated by working group members. If they are correct, on average, there exists a requirement to procure in the neighborhood of 10,000 terminals by the end of the decade.

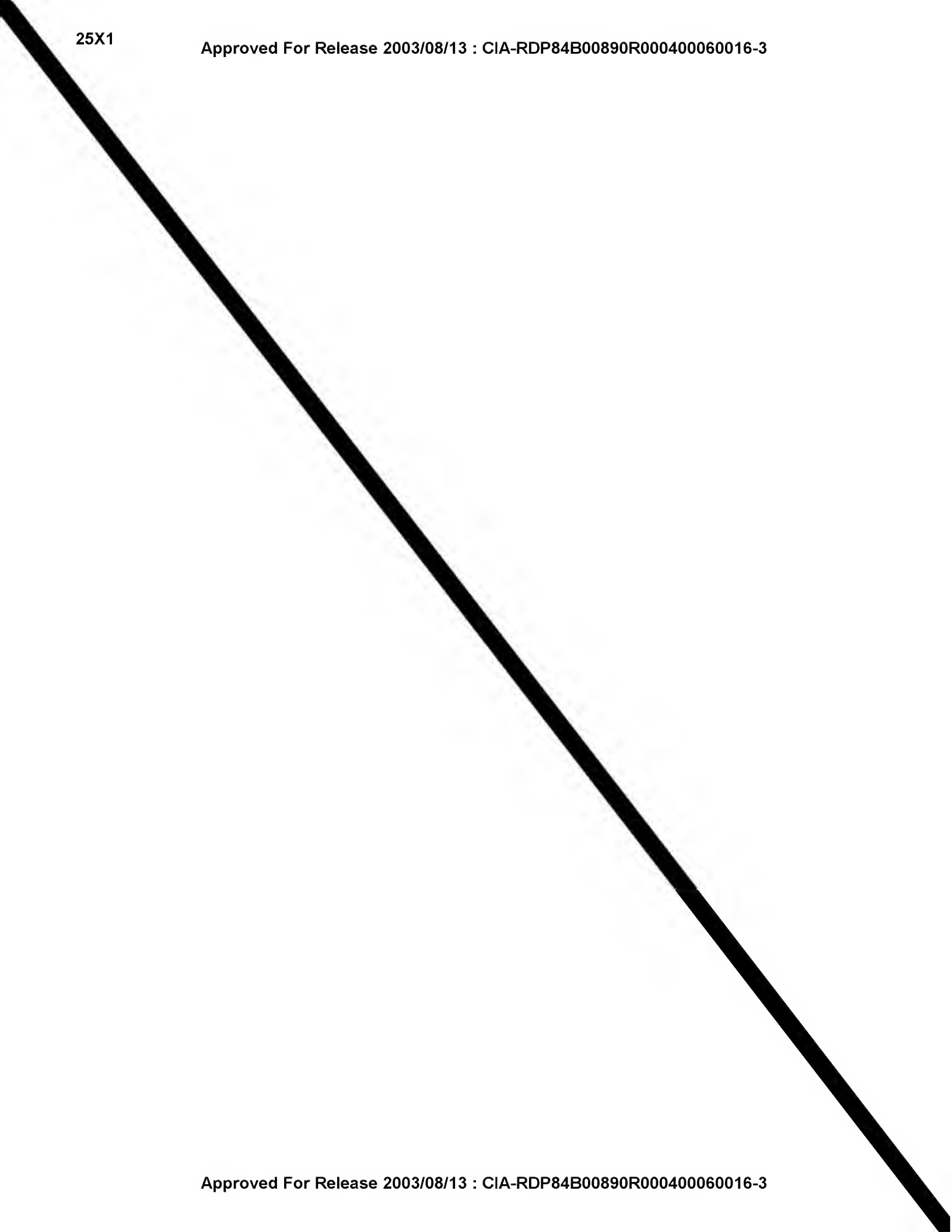
If 1988 is assumed to be the target date, the growth curve for installed terminals will look something like the curve in diagram 4. Given that over 50 percent of our current base of terminals will need to be replaced, the Agency must then acquire terminals at least at the rate of approximately 1250 per year.

Today's terminal costs in the neighborhood of $5,000 to $14,000 for the hardware, including the cost of a hardcopy device for every two terminals. Installation charges can range from several hundred dollars to install a terminal on the RED GRID system to a couple of thousand dollars to install a terminal in the Wideband Bus System. $10,000 is probably pretty close to an average, in terms of today's technology. At that price, the total cost to provide those 10,000 terminals is $100,000,000 in 81 dollars.

Leasing stand-alone word processors, as we are doing now, is not an attractive alternative. In fact, the high cost of leasing is a strong motivator to purchase. Today, the leasing cost for the approximately 600 stand-alone word processing terminals in the Agency is approximately $250,000 a month, or $3,000,000 a year. In general, our total unit lease costs equal the purchase price at somewhere between two and three years.

It seems reasonably clear that if the number of terminals required is similar to that projected, the direct concern is the strategy of acquiring them: how to get a lower average cost of an installed terminal and what the time-phased acquisition program should look like. This latter then needs to be further defined in terms of its composition in terms of major categories.

To get a lower average cost there is probably only one option and that is to plan for a price break deliverable by commercial technology, implemented in accordance with TEMPEST requirements.



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That means that a time frame, such as 1983 to 1984 should be defined, during which new commercial technology will be exploited. Further questions are then, for what types of terminals or terminal functionalities? These expressions have to be broadly stated, since future terminal capabilities cannot be projected with a high degree of accuracy.

Probably the big question is, how much are [redacted] terminals worth to the Agency in FY-81 dollars? This can be translated as saying that the terminal question may be more a design to cost problem than a question of how much performance is desired/required. 25X1

IV. QUESTIONS

The questions that need to be addressed in dealing with strategic planning with respect to terminals includes:

1. What should the ultimate percentage allocation of terminals be (update of Table 3) and when should it be achieved?

2. What are the characteristics of the quantity of terminals that have been determined in response to question 1?

   a) What are the requirements for word processing?

   b) What are the requirements for data processing?

   c) What are the requirements for office automation? Electronic Mail? Time Management? MIS?

   d) What are the graphics requirements?

   e) What are the availability requirements with regard to both the terminal and system? (distributed vs. centralized functionalities)

3. What are annual terminal requirements by directorate by type of terminal?

4. What are the peripheral requirements for terminals? What are the requirements for local printers? local communications?

# Information Handling Facilities

## Data Bases

I. Scope

Strategic planning activities for data base facilities are to consider the needs for creating, accessing, and processing text and non-text (formatted, graphics, imagery) information.

We believe that the requirements for automated data bases will expand at a rapid rate during the eighties:

We will be challenged by

- o Increasing quantities and sizes of data bases
- o Increasing numbers of users
- o The need to make data bases more widely accessible
- o The need to provide easy to use tools (Query Languages, statistical analysis, modeling, graphics support, and perhaps generalized program libraries) to allow effective utilization of large quantities of data
- o The need to understand new data base technologies and how to effectively integrate those technologies into the Agency environment

Planning groups are tasked to reduce this generally described challenge to more specific goals and objectives so that Information Handling Programs can be initiated and targeted. In doing so, we will review the status, and planned enhancements, of current facilities and identify any deficiencies; we will extract data from the current environment which determines trends from which we can project; and we will ask user communities to respond to issues and questions, the resolution of which is intended to lead to specific strategic user needs for the eighties.

II. Status

A. Current

Data Bases within the Agency are diverse in size, use, and complexity. They range from those that are small, run on minicomputers for a very limited number of users, to those that are large and complex which reside in large hardware systems with many (and somewhat diverse) users. In general, the Agency's Data Bases have been created and maintained for a specific component and for a specific purpose. There has been relatively little effort in examining commonality of use between components. This is understandable due to the project and mission orientation of many Agency components.

Large and complex Data Bases usually reside in (on) the large computer systems in the two ODP computer centers, the Ruffing Center or the Special Center. This is of necessity because of the large amounts of information to be stored and the attendant effort necessary to "run" and "maintain" them.

The DO and COMIREX Automated Management System (CAMS) Data Bases reside in the Special Center because of security and isolation considerations. These Data Bases are custom tailored to specific needs and range from large document DBs to operational support and tasking DBs. Included are hardcopy with index DBs (DORIC/W-ALLSTAR) and many records DBs.

NPIC maintains the Installation Data File and related information within the NPIC Data System on Univac hardware [redacted] This Data Base is used for NPIC support and operational support to the community via COINS. 25X1

The remainder of the Agency is provided Data Base support in ODP's Ruffing Center. Again, these are generally tailored for specific use and range in size and complexity. Access and use is largely dictated by user (customer) requirements.

The Agency has attempted to provide Data Base services by providing a "standard" Data Base Management System for information storage and retrieval. Currently, the Generalized Information Management (GIM) System is provided for specific relatively large applications and RAMIS is provided for smaller, less sophisticated Data Bases. RAMIS is used extensively for its Report Writer capability.

The current provision of generatized DBMSs to satisfy user's specific needs has resulted in many "custom made" Data Bases for many users. The established trend is toward specific users and, when needed, large "systems" to meet component needs (SAFE and CRAFT for example).

B. Trends

Historical data shows a continued increase in both the number of Data Bases and their use. In the ODP Ruffing Center the number of GIM Data Bases is constantly increasing as shown.

| Year | Approximate Number of GIM Data Bases |
|---|---|
| 72 | 2 |
| 73 | 3 |
| 74 | 7 |
| 75 | 11 |
| 76 | 15 |
| 77 | 19 |
| 78 | 24 |
| 79 | 29 |
| 80 | 34 |
| 81 | 37 |

(See figure 1)

These GIM Data Bases are varied in scope. They cover registries, accounting systems, resource management systems and specialized information systems. Numbers are expected to increase even more rapidly in the future, especially with increased registry automation.

Use of Data Bases has also been increasing rapidly. Examples of this are:

CAMS:

CAMS is the Intelligence Community's Imagery requirements management tasking and accounting system. Its growth pattern is:

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-- CAMS users need access to data contained in NPIC's NDS, however, are unable to do so from a CAMS terminal.

-- OASIS is an annotated "subset" of the NPIC NDS but is maintained as a separate Data Base.

-- Many Data Bases contain copies of cables but there is no one central "file" which is immediately accessible by all.

-- Data Bases containing information on various physical aspects of the Agency exist, but not cohesively. There is no consolidated source or method of accessing all holdings (phones, WPs, safes, etc.) of a particular office, component, function, etc.

-- SAFE will redundantly contain much information that is also held in other Data Bases.

-- Many offices maintain biographic Data Bases. Single users often do not have access to all such Data Bases.

In general, the existing Data Bases show a strong trend toward increased use of approximately triple in each five years (in either number of users or actual use). Major revisions are made when necessary, (for example, CAMS and NDS in 1984 to provide for new/changed systems) and files and users are added as requirements dictate.

III. Issues

A. Issue 1 - Data Base Growth

As can be seen from the trends, Data Bases and their use continue to grow. Therefore, the Agency must provide the procedures, methods, equipment and personnel necessary to cope with this expanding demand. The growth of, and required changes to, Data Bases must be quantified for future time periods.

Along with this is needed the definition of the characteristics of required Data Bases. Their size, types, expected uses, and configurations must be established. This will influence the capabilities the Agency must provide for them.

B. Issue 2 - Data Base Services

Data Bases are used for specific purposes and these purposes define their structure and the functions needed to operate them. In order to obtain the "tools" necessary to provide Data Base services in the future they must be defined now so that they will be readily available when required. These could be functions such as text searching, calculation capabilities, report writers, etc. Also, the degree of "user friendliness" must be scoped.

With respect to this issue, the adequacy of the Agency's current DBMS must be examined. Primarily, are GIM and RAMIS (the two Agency DBMSs) adequate? If they are adequate but need enhancements these should be defined. The industry now has many DBMSs available and they could be used to satisfy some Agency needs. Which readily available DBMSs or functions should be implemented by the Agency must be established.

C. Issue 3 - Data Base Concepts

The current concept of a Data Base being a defined and "isolated" collection of character data does not necessarily hold in the future. Non-character information, foreign language Data Bases, and Data Base interoperability are concepts that are just now being envisioned. The requirements for these types of functions should be defined.

The Data Base Administration function has largely been ignored by the Agency. Because of this there are many overlapping, redundant, and restricted Data Bases. The need for a unified cognizant component that will "broker" data, functions, and capabilities would alleviate much of this overall shortfall. User services, focused requirements, and overall efficiency could be provided by this entity.

IV. Questions

A. Growth

What are the numbers of, types of, sizes of, and characteristics of Data Bases that are required in the next ten years?

What is the requirement, if any, for a Data Base of "external" information (AP, UPI[redacted]DJ, etc.)?

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B. Services

What new/changed functions (services) are needed to support future Data Bases (or current ones)? Are commercially available DBMSs required as standard Agency "tools"?

Is it envisioned that Data Bases will be developed by vendors that will employ industry "standard" DBMSs? If so, what provision must the Agency make to accept them (the Data Base and DBMS) for internal use?

To what degree is "user friendliness" a factor in Data Base needs? Are there services/standards known to be available which the Agency should use?

How are Data Bases to be used in the future? Are they really "reference services", or administrative services, or operational components of the Agency's normal activities?

C. Concepts

What are the conceptual changes expected in Data Bases? Are the following envisioned?

-- Foreign language Data Bases

-- Non-character information

-- Efficient information transfer and/or access

How should the architecture provide for the future? Should Data Bases be amalgamated for greater use? Fragmented? Connected?

Is there a need for an overall Data Base component to oversee growth, functions, information needs, etc.?

What specific performance requirements apply to future Data Bases (speed, common data, languages, etc.)?

# Information Handling Facilities

## Data Transmission, Dissemination and Distribution

### I. Objectives

The objective of this paper is to focus attention on the data communications issue from the user viewpoint. The paper is intended to assist the working groups in defining in clear and concise terms perceived user issues and, to the extent possible, the user requirements for data transmission and distribution links through the year 1989.

This paper will direct attention to the data communications process and identify user problems that may arise as total electronic data distribution systems become a reality. As well, we would hope to identify perceived user requirements for services which transcend those available from systems which are currently deployed and/or now undergoing upgrading. The range of user services that are projected to be available in this era will be investigated as well as the timing for implementation.

### II. Definitions

Data Communications links are defined as the electronic medium which enables information to be transferred from one user to another user. To clarify and focus these considerations it is useful to address them in terms of the following categories:

- o Long Distance Data Transmission Links - Transcontinental and/or international in scope.
- o Regional Data Transmission Links - Confined to an easily circumscribed or conveniently defined locality; e.g., the Washington, D.C. metropolitan area, Northern Virginia, etc.
- o Local Data Distribution Links - Generally confined to a specific building or compound, usually not requiring outside carrier services.

At the terminus of the data transmission links, the data dissemination and distribution functionalities then take over

responsibility for timely delivery of the data to the designated users. Within the Agency, dissemination has traditionally been defined as the process of determining who should be made aware of the acquired information, while distribution is defined as the actual movement of the appropriate information to the user. Electronic mail would provide the above services, but with the absence of paper as the user medium.

III. Status

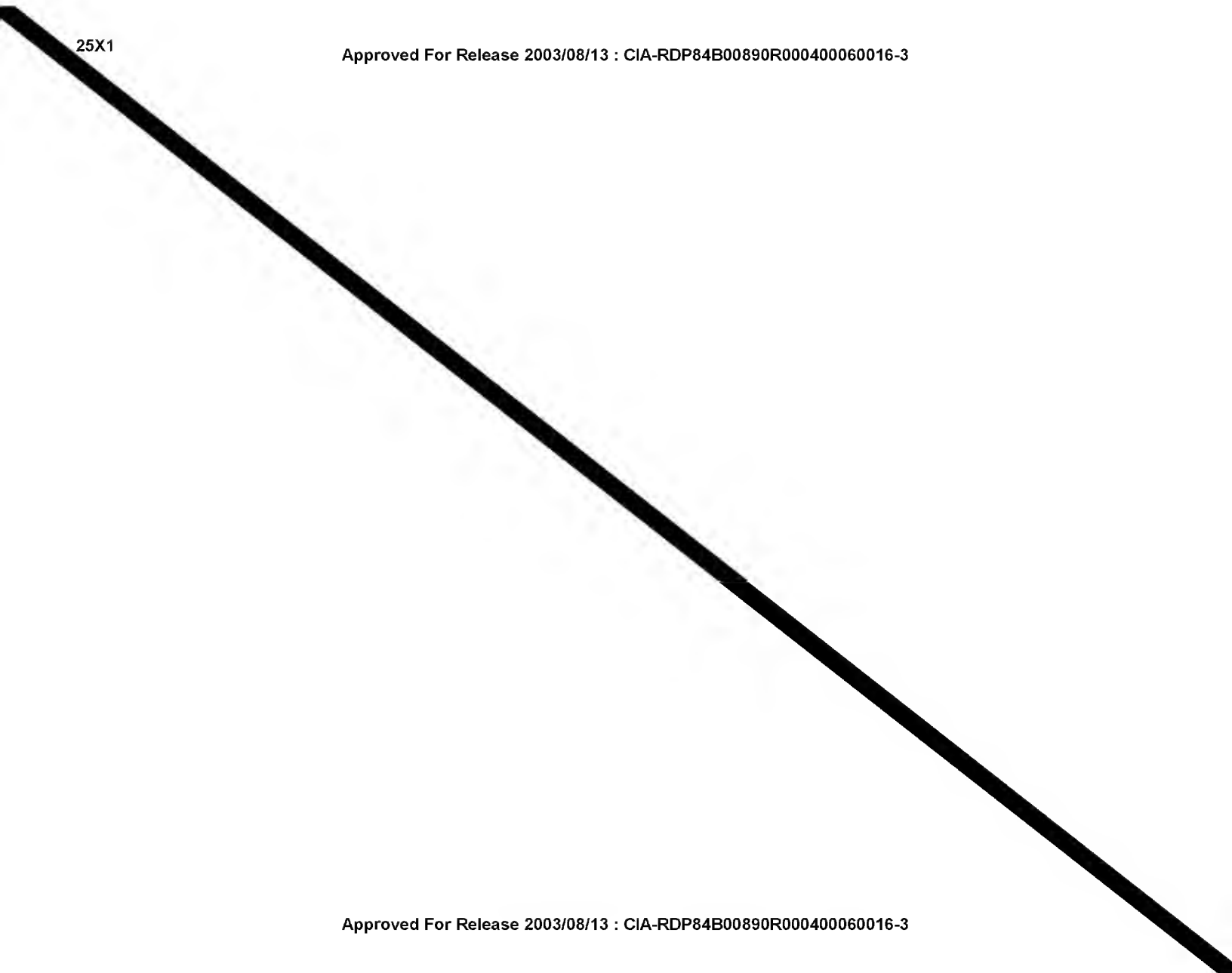
The Agency is currently served by myriads of dissemination and distribution "systems." Voice services aside, these systems service three general types of information: electronic record, paper documents, and graphics. (For this presentation, voice services via a secure phone at every Hqs officers desk is presumed.) Present services to Agency field stations are further broken down as record communications (messages plus some data, Facsimile and interactive keyboard teleconference) and non-record communications (Secure Voice).

A. System Architecture

1. Overview

A description of the Agency's current distribution system architecture at Headquarters is presented in the diagram on the following page. In this depiction consumers are identified at the end of each line (without boxes) while information processing entities, both hardware and/or software are identified within the rectangles. Only major entities are depicted, and special user channels and low volume linkages are not shown.

The vast diversity and the hierarchial arrangement of systems through which the Agency's electronically recorded information is disseminated and distributed is evidenced in this diagram. As a current example, the Interim SAFE system is one of the most elaborate of these systems, providing dissemination and distribution of a wide variety of information. Interim SAFE is served, in turn, by other systems (MAX, CDS and DATEX) which disseminate information to it. Within Interim SAFE, users establish profiles against which incoming information is compared and then electrically distributed.



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2. MAX

The Office of Communications development and deployment of three Message Automated Exchange (MAX) Systems in the late 60's represented our first excursion into automated message routing of cable traffic, this effort being mainly directed toward supporting DDO's requirement for message services with its overseas stations. To augment this system four fieldbased message switches (ARS's) were later installed at OC communication base stations overseas.

3. CDS

Electronically based information distribution has been served since late 1977 by the Cable Distribution System (CDS) which disseminates cables, based on profiles and full text analysis, in both hard copy and electronic form. Today, about 30 percent of the Agency's staff cable traffic is automatically distributed. For distribution of non-Agency source traffic that is routed through our facilities the figure is nearly 90 percent. Overall, approximately 60 percent of the cable traffic that is processed in the Headquarters building is electronically distributed, hence manual dissemination is much employed in the the Cable Secretariat's (CDS) operations.

4. APARS

APARS, when it becomes operational in November, will ultimately yield a much higher statistic for the cable reproduction and collation process, delivering the traffic ready for branch-level distribution via the paper medium. Beyond APARS and the four remote APARS in the DDO, however, each component is effectively responsible for disseminating their own documents. In addition to this, there may be further second, or even third, order paper dissemination. This is accomplished by a myriad of registries, Watch Officers, ICO's, etc. having no single unified criteria used in the process. Distribution of other documents also varies widely. Courier systems are set up and run by various organizations, individuals and "Channels". Inevitably there are problems with "late" mail, multiple deliveries of the same document via different systems, and consequential proliferation of paper. Accountability is also a continual security problem, as is the handling of compartmented information.

5. ADSTAR

Graphic information is, at present, totally disseminated and distributed manually. When ADSTAR becomes operational it will automate much of the graphics search and retrieval process.

B. Distribution

1. Grid

Most of the electronic data distribution within the Hqs complex has for many years been satisfied by a twisted pair (copper wire), red data grid system. This grid is presently limited to approximately a 9,000 pair capacity, but plans are underway to expand the grid to about 10,400 pair by the end of CY-81, and 20,400 by the end of CY-82. The maximum expansion capability of the Hqs red grid system is postulated to be 28 to 30 thousand pair, much of which may be realized within the next few years. Grid systems of this nature, however, are generally limited to a maximum reliable data rate of about 19.2 Kbps. A similar grid has been installed [redacted] and an Ames Building grid is scheduled for installation shortly; twisted pair grids are also slated for later installation in other Agency outbuildings. All connections to the grid are hardwired and when terminals are removed it is now accepted practice to pull that connection out back to the nearest wire closet. (See the Carrier-Rate Table for the range and type of services available from particular carrier mediums.)

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2. Bus

The SAFE project is bringing with it a Black-data coaxial cable bus system which is now being installed in the Hqs building. As shown on the carrier-rate table, this type of bus technology has the potential to handle multi-megabit data transfers, although the Bus Interface Unit (BIU) is currently equipment-limited to a 19.2 Kbps rate. While the Interim SAFE terminals are now link-serviced at from 1200 to 4800 bps, the standard service for SAFE terminals will be 9600 bps.

Carrier-Rate Table

| Usual Service Provided | Rate | Carrier |
|---|---|---|
| Teletype and very slow speed data. Includes keyboard teleconferencing and off-line messages | TTY Speeds (75-600 bps) | HF Radio and unconditioned copper (twisted pair) lines |
| Messages, data manipulation, data exchanges, slow speed digital FAX, low resolution graphics, Narrow-band Secure Voice | Low Speed Data (1.2-9.6 Kbps) | Low-power Satellite Radio, Conditioned Copper (twisted pair) lines |
| Data Base Transfer, High Speed FAX, Slow Scan or amplitude compression, Secure Teleconference, Medium Resolution Graphics, High Quality Secure Voice | Medium Speed Data (19.2-512 Kbps) | Medium-power Satellite and Microwave Radio, Coaxial copper cable |
| Very large data base transfer, High resolution graphics (Imagery), Television, High Quality Video Teleconference | High Speed Data (1.544-50 Mbps) | High capability satellite and microwave Radio, Conditioned Coaxial Copper Cable and Fiberoptic lines |

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services. In many cases, suppliers are responding to specific user requirements without following an orchestrated plan or a common methodology. In considering this problem, there are three different dissemination criterion that may be considered:

-- Creator generated (information provided to A, B and C)

-- Content determined (A gets all information containing these words, etc.)

-- User determined (search and retrieve)

Each of the above methods will be required in the future and the capability to "examine" information once it is stored electronically supports all three methods of dissemination very efficiently. "Commonality" in the dissemination/distribution process remains nonetheless a much needed capability. An individual or component today must depend on a multitude of methods, systems, and procedures to have his requirements met--different types of profiles in different electronic dissemination systems, different people and registries for different documents, etc. Although there is, admittedly, no "one way" to state requirements to all systems for all products, the advantages of designing future systems to standard protocols using compatible interface criteria from a well-defined, orchestrated system overview would be a great stride forward.

2. Cohesive Design

Since the requirements of the sponsoring user normally prevail in system design considerations, continuation along our current course will likely lead to a greater diversity in our information handling systems, each with limited perspective and methodology. This may well result in a user-tailored and/or user-owned system that yields to a complex diversity of overall criteria with little thought would be given to other systems (or related requirements) and the greater system cohesiveness that is sought after.

3. Human Judgment

Dissemination based on human judgment is inevitably eratic due to fatigue, environmental and personality factors. As well, personnel changes with attendant training and security

considerations stress and perturb these procedures during transitory times. This is not to suggest that human judgement will ever be totally eliminated from the dissemination process; nor should it be. However, there are yet labor intensive dissemination processes which can simply be done better by machines, recognizing that it is oftimes difficult to consolidate the criteria used by, or the rationale used within, many human dissemination processes.

4. Minimize Paper

To a large extent, planned "systems" still look to paper as the beginning and/or ending of the process. Accordingly, the capability to generate, transfer and deliver information electrically is severely impaired. Principal among the objectives to improve the information flow within the organization over the next decade will be the effort to minimize the amount of paper both created and distributed throughout the organization. (Along with cable and other data traffic, this implies that "word processors" should be tied "on-line" into a central dissemination/ distribution(s). Compatability with and interoperability between these systems will therefore eventually become highly desirable, if not an outright necessity.)

5. Greater Productivity

Lastly, speed and accuracy considerations argue persuasively for future dissemination and distribution to be accomplished electronically wherever possible. This also supports the increased (and ultimately exclusive) use of electronic collection, transmission and sorting of both classified and unclassified information so that it can be disseminated and distributed to the individual user via electronic means. This will promote greater system compatability and encourage wider use of machine-assisted techniques to assist the user in doing a better job in less time.

C. Field Services

1. Potential

In the field, the spectrum of services that could soon be made available to enhance productivity and improve support from headquarters also represent an area that impacts signficantly on

the overall Agency ADP profile. The limited bandwidth of our traditional data communications links with the overseas stations has presented a severe restriction on the amount and the types of information that could be electronically exchanged with the field. However, over the years developments in satellite communications and, more recently, in packet-switching technology have revolutionized the communications industry. OC's MERCURY program utilizes packet-switching and will make available to the Agency a great expansion in operational and administrative support capability. As the satellite communications carrier services with each field station realize a commensurate upgrade in data carrying capacity, the versatility of the packet-switched network will permit many users dreams to become realities. Many of these services could be available in the field by the mid-eighties and probably all of them by the end of the decade.

2. Link Capability

On the following pages is a listing of future Field Station service capabilities broken down into five general service categories. The categories are keyed to the MERCURY RFP, Network Architecture definitions and portend service--dedicated communication links of approximately 2.4 Kbps (small stations), 4.8 Kbps (medium stations) and 9.6 Kbps (large stations). There follows a discussion of the services that are thought to have particular user interest, hence they are addressed individually along with some suggestions of how these services may also apply to information transfer within the Hqs complex. Users will be asked to assess the value of these services with regard to their operational requirements.

3. Field Service Listing

a. Narrative Messages

(Expanded Formal Message Service - many types converted to share a common/general format using abbreviated message format (AMF) from which accounting, logging and processing information can be automatically derived.)

(1) Regular Command and other Wide Distribution Traffic (policy, operations, approvals, etc. -- may include SCI, SI and others)

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e. Facsimile, Slow Refresh Video Teleconferencing (3.d.4)

The technologies of digital facsimile and teleconferencing are, in many ways, very similar since they, too, represent vast quantities of unformated bulk data to be transferred. Accordingly, to be time responsive, they require a digital link of at least 19.2 Kbps, and will then provide an image transmission or refresh on the order of every 10 to 60 seconds. The higher the desired resolution the lower the refresh rate, and resolution is usually a control variable. By using slow scan or extreme compression techniques, Black and White secure teleconferencing can now be achieved over medium rate links as low as 19.2 Kbps. Over time, technological advances will improve the quality of these services. Very slow scan (every 15 seconds or so) color services are now available over 56 Kbps carriers. The old AT&T continuous image teleconferencing concept has generally been abandoned because of its impractical 3 Mbps data rate requirement.

Digital Fax services can be provided at a relatively modest cost making them practical for many Agency users. However, they do require special terminal equipment at each end and a service-dedicated channel. To provide video teleconferencing with interactive secure voice would probably necessitate a 56 Kbps link as well as the associated terminal equipment. As these services become more pronounced it would be prudent to provide a common user teleconferencing (and facsimile) centers at strategic locations through the Headquarters complex, thus improving these services and making them routinely available between Agency buildings in the Washington area as well as providing a new service to selected overseas facilities.

f. Voice Memoranda and Special Secure Voice Services (3.d.5)

Voice memoranda are digitized voice messages that are processed in the same store and forward manner as written traffic. They will soon become practical as a consequence of new electronics technology which will permit great compression of the bandwidth requirements relevant to normal voice. The primary usage is for daily administrative and management functions. It permits improved professional time management through release from the interrupt in operations enforced by the telephone's

immediate-connect mode of operation. The necessity of the caller frequently investing in a series of calls to make a single connection is eliminated since the digitized message is stored and later delivered when the callee is available. This part of the process could be handled as an electronic mail type of function.

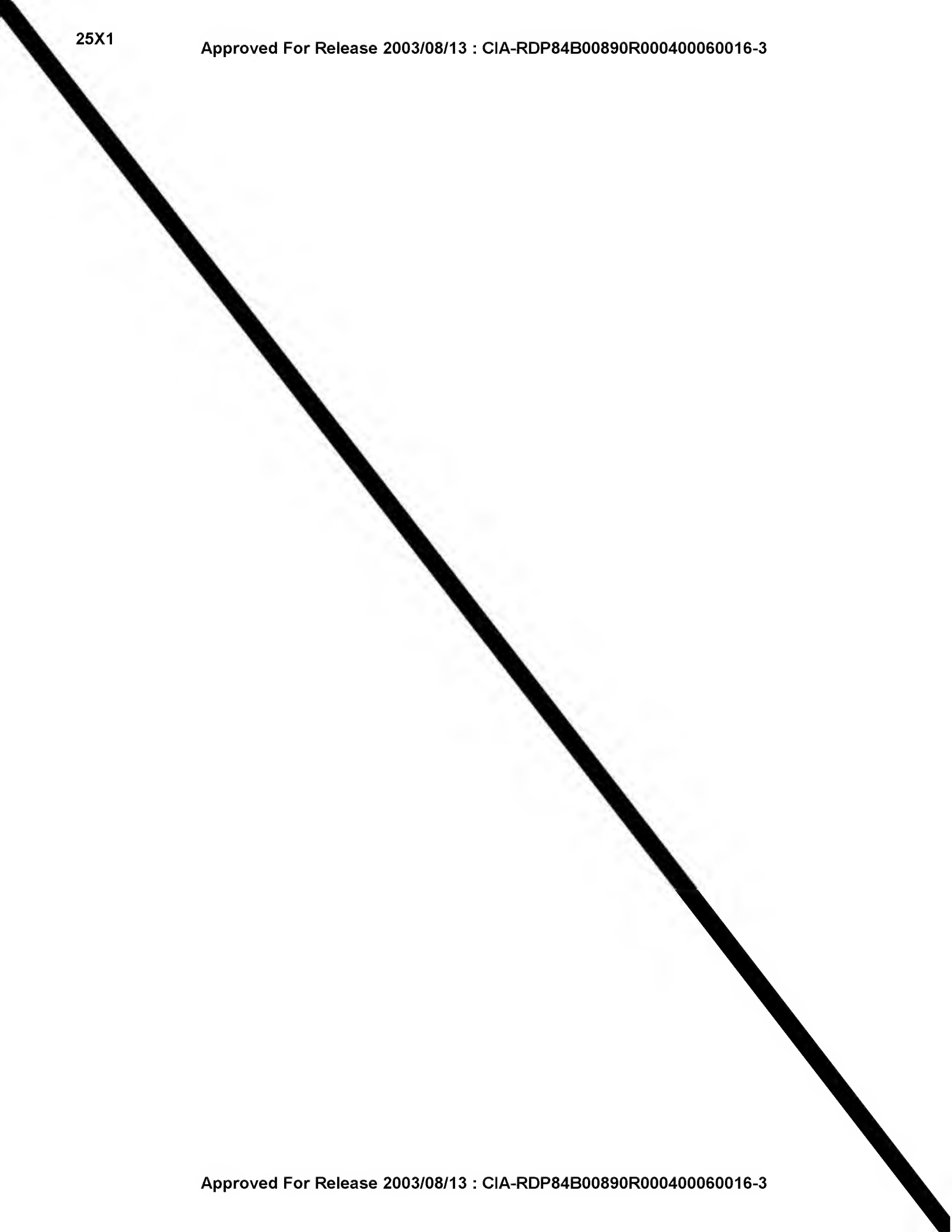
g. Medium-Resolution Image and Graphics Capable Terminals (3.d.6)

Data terminals which are medium resolution, graphics capable are now commonly available in the commercial marketplace. As soon as TEMPEST -approved versions of these devices are developed, they will be a tool available to the Agency.

The primary applications are in data base work and word processing. In both applications, graphics images are created or selected, used in some context, and stored. We now have powerful, high-resolution graphics terminals in the Agency, but they are so expensive that their broad proliferation is impractical. Such high resolution capability, however, is not necessary for the bulk of the work being handled, such as graphs, line drawings, medium resolution maps, layouts, mug shots and the like. Low resolution requirements of this type can often be handled satisfactorily by a 16-shade facsimile capability, whereas medium-resolution processing requires the higher data rates and an advanced data terminal.

V. Trends and Projections

Future systems design considerations and office-level strategic planning exercises have prompted Agency IHS providers to make a number of traffic analysis and growth projections. These projections are generally derived from current and past system usage statistics and user estimates of growth from new requirements that have not yet impacted on the system. The following graph depicts the growth in cable traffic volume (both total network and agency-only levels) and the growth in data message volume over the past six years. (The DATEX projection does not, however, take into account the substantial impact of the new CDS link-up; narrative traffic has been distributed via this link only since June 1981. See Signal Flow diagram.)



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The table that follows contains the MERCURY system projections for all different traffic types as developed in the preceeding paragraph. These projections were derived as depicted above using extrapolations from the approximately 11 percent annual growth in Agency cable traffic and the 28 percent annual growth in data traffic that has been experienced in recent years. Moreover, these statistics reflect the order-of-magnitude increases in general data traffic that are expected to result once an interactive CRAFT is serviced by a full-capability (in phases) MERCURY and an expanded SKYLINK system. They also reflect the reduction in traditional cable traffic volumes that is expected, since much of the information transfer that is now made in this format will be more efficiently conveyed via MERCURY as preformatted data messages. Considering all categories, the overall growth in data transmission requirements once interactive sytems are on line is, indeed, going to be impressive and challenging.

VI. Issues

The issue statements below are to provide a general frame of reference from which the users can examine the specific questions in the following section. Although the questions are arranged in order (relative to the issues), an appropriate response may, in some cases, relate to both issues.

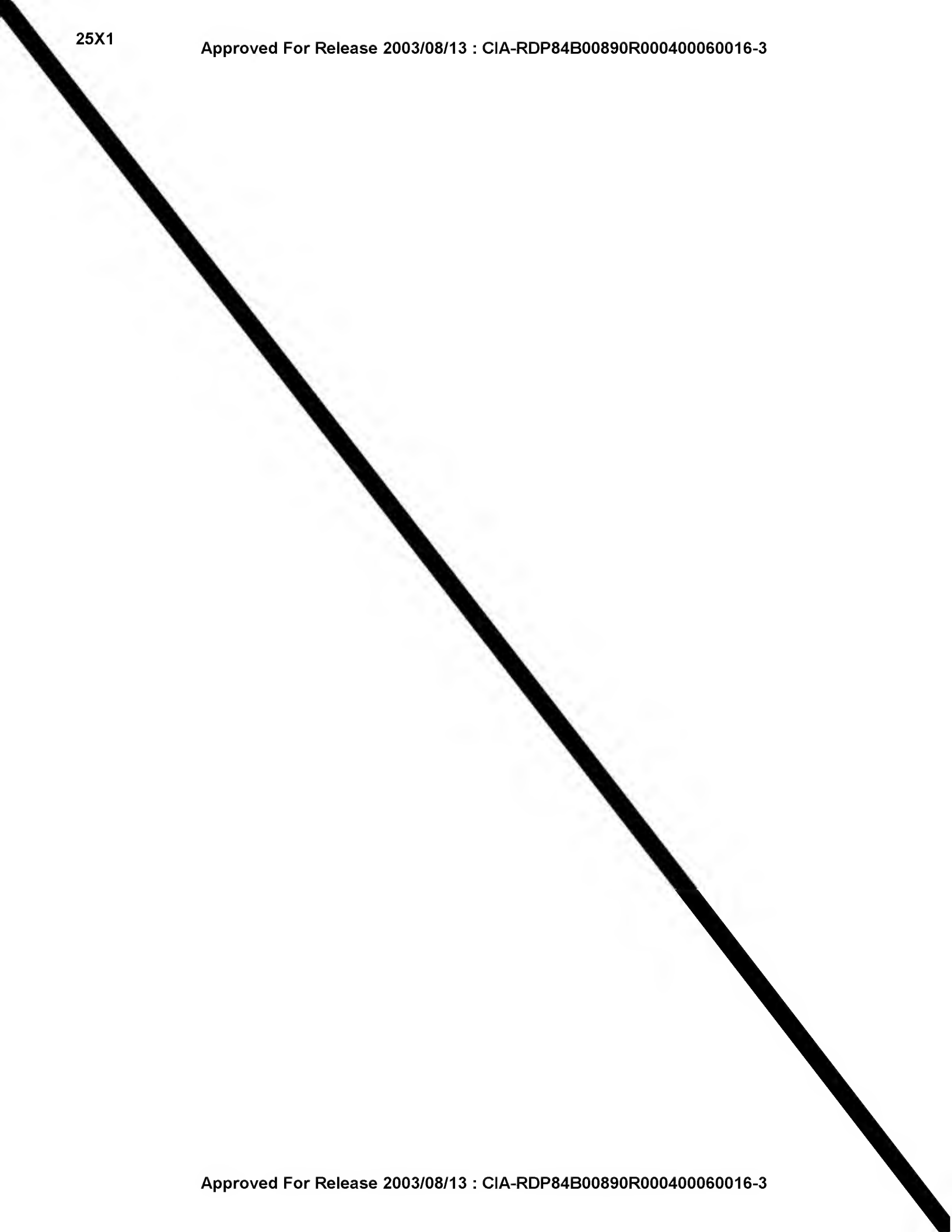
Issue A - DATA DISSEMINATION AND DISTRIBUTION AT HEADQUARTERS

ASSURE THE ADEQUACY OF FUTURE DATA DISSEMINATION AND DISTRIBUTION SYSTEMS TO SATISFY THE PERCEIVED USER NEEDS OF THE 1980's. EXAMINE AND EVALUATE CURRENT AND PLANNED DISSEMINATION AND DISTRIBUTION SYSTEMS AND, AS REQUIRED, RECOMMEND APPROPRIATE ADJUSTMENTS TO FACILITATE THOSE SYSTEM IMPROVEMENTS THAT WILL SATISFY USER TRENDS AND TAKE ADVANTAGE OF EXPECTED TECHNOLOGICAL DEVELOPMENTS.

Issue B - COMMUNICATIONS SERVICES WITH THE FIELD

FROM A COMPREHENSIVE EXAMINATION OF THE INFORMATION PRESENTED IN THE LAST PART OF SECTION IV.C, DETERMINE WHAT RANGE OF IH SERVICES ARE MOST REQUIRED AND ARE OF GREATEST UTILITY FOR FIELD DEPLOYMENT BY THE YEARS 1985 THRU 1989. EVALUATE SERVICE, COST, TIMING, TRADE-OFF FACTORS AND CONSIDER THE IMPACT OF

25X1 [redacted] REQUIREMENTS WHERE APPLICABLE.



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VII. QUESTIONS

A. What are the problems that users see with the dissemination/ distribution system that is evolving here at Headquarters? What is the preferred criteria for dissemination at the various levels? How does "need to know" (and other security considerations) affect this?

b. What problems do users have (if any) with the development of a standard message format for Agency message traffic?

c. Should the information dissemination and distribution system be expanded to accommodate unclassified wire, news and data sources?

d. What will be the future applications for local networks? Why will they be required?

e. How should we handle the mechanics of terminal access in the transition period from relatively few terminals to a time where terminals are readily available to all employees who can use them? What are the relative merits of personnel dedicated terminals over personnel-movable shared terminals? Over fixed -location, shared terminals? How much appeal would a rapid-access, plug-in dataport have to users? How much validity does the old "terminal room" concept have?

f. What will be the time-phased demand for committing all cable and data message traffic to electronic distribution medium? To what extent will paper channels still be required? At what intermediate level would this information be expected to enter/exit the dissemination/ distribution system?

g. What is the time-phased demand for interactive links with field stations? Between field stations?

h. What will be the time-phased demand for electronic distribution of the many regulatory issuances, notices, bulletins, instructions, etc. that are now delivered via pouch/mail channels? Will hard copy always be a requirement for certain classes of documentation?

i. What will be the time-phased demand for facsimile, teleconferencing and graphics services requiring medium-speed (19.2 - 256 Kbps) data rate link capability in the field? What growth in requirements of this type is expected locally (between buildings in the Headquarters area)?

j. What will be the time-phased demand within the headquarters community for work station imagery, secure television or other services requiring high-speed (1.544 Mbps and more) data links.

k. In terms of user requirements and desirability, which of the field station services listed in section IV.C are most urgently needed? Are there any services presented which are not justifiable?